REMARKS

Claims 1-28 are pending. By this Amendment, Claims 1-5 and 7-9 are amended; Claim 6 is canceled without prejudice or disclaimer; and Claims 11-28 are added.

Claim 1 is amended to incorporate subject matter of originally filed Claims 6 and 7. Claim 11 corresponds to originally filed Claim 2, rewritten into independent form, and Claims 12-19 correspond to originally filed Claims 3-10, respectively. Claim 20 corresponds to originally filed Claim 7, rewritten into independent form. Claims 21-28 depend directly or indirectly from Claim 20.

Applicant respectfully submits no new material is presented herein.

Allowed/Allowable Claims

Applicant respectfully acknowledges and appreciates the indication by the Examiner that Claims 3-5 and 8, although objected to for being dependent upon a rejected base claim, would be allowable if rewritten in independent form, including all of the features of the base claim and any intervening claims.

Claim Objections

Claims 2-5 are objected to for minor informalities therein. Applicant has amended Claims 2-5 responsive to the objection. Accordingly, Applicant respectfully requests withdrawal of the objection.

Claims Rejected—35 U.S.C. § 103

Claims 1, 6-7, and 10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,424,941 to Bolt et al. ("Bolt '941") in view of U.S. Patent No. 6,705,199 to Liao et al. ("Liao '199") and further in view of U.S. Patent No. 5,718,160 to Ohsumi ("Ohsumi '160"). Claim 2 is rejected under 35 U.S.C. § 103(a) as

being unpatentable over Bolt '941, Liao '199, and Ohsumi '160, and further in view of U.S. Patent No. 5,673,615 to Kawakami ("Kawakami '615"). Claim 9 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Bolt '941, Liao '199, Ohsumi '160, and further in view of U.S. Patent No. 5,391,002 to Eigenbrod ("Eigenbrod '002"). Applicant respectfully traverses the rejections.

Claim 1 recites a precision positioning device including, among other features, a pneumatic cylinder fixed so as to extend along the vertical direction; a piston member slidably accommodated in the pneumatic cylinder in a non-contact state via bearings, and including a piston head and a rod extending from the piston head along the central axis direction, the inside of the pneumatic cylinder being divided into two pressure chambers by the piston head; and a position sensor for detecting the position of the piston member, wherein the piston member has an aperture formed in the central axis portion thereof and extending along the central axis direction thereof, and wherein the position sensor is formed in the piston member through the use of a fixed shaft that has been inserted into the aperture from above the pneumatic cylinder.

Bolt '941 teaches a positioning apparatus for a pneumatic actuator including a valve (50), an actuator (90), and a controller (40) for controlling the operation of a spool (27) of the valve (50). The actuator (90) also includes a pressure sensor (29) for measuring a pressure (P_b) of a first chamber (b), a differential pressure sensor (29ab) for measuring a differential pressure between the first chamber (b) and a second chamber (a), and a position sensor (12) for determining a position of a piston rod (10). The piston rod (10) is secured to a piston (38) within the actuator (90) that divides an internal cavity of the actuator (90) into the first and second chambers (a), (b).

Liao '199 teaches a precision servo control system for a pneumatic actuator (2). The rodless pneumatic actuator (2) includes an elongated cylindrical body (23) having an internal bore (3) and an elongated slot (4) extending through a wall of the cylindrical body (23). A reciprocally moveable piston (5) is positioned within the bore (3) and is adapted for reciprocal movement back and forth within the bore (3) in response to fluid pressure introduced or exhausted from fluid pressure chambers (7) and (8) formed on either side of the piston (5). A carrier (6) is connected to the piston (5) and extends through the elongated slot (4). A sealing means in the form of an elongated sealing band (90) is provided to seal the slot (4) and, thus, pressure chambers (7) and (8) as the piston (5) moves within the bore (3).

Ohsumi '160 teaches a positioning device having a piston (1) integrally formed with a table (1a) and disposed in a cylinder (2). The table (1a) is disposed outside the cylinder (2) through an opening portion (2a) of the cylinder (2). Pressure-adjusting portions (6) and (7) communicate with two pressurizing chambers (3) and (4), respectively, in the cylinder (2), formed on opposing sides of the piston (1). The piston (1) is hollow, and a gas groove (1b) is provided on both end portions of the face including the table (1a), for a shield and for forming a hydrostatic bearing between the opening portion (2a) and respective pressurizing chambers (3) and (4).

Regarding Claim 1, Bolt '941, Liao '199, and Ohsumi '160 do not teach or suggest each and every feature recited in Claim 1. Particularly, Bolt '941, Liao '199, and Ohsumi '160 do not teach or suggest a piston member slidably accommodated in the pneumatic cylinder in a non-contact state via bearings and a position sensor for detecting the position of the piston member, wherein the piston member has an

aperture formed in the central axis portion thereof and extending along the central axis direction thereof, and wherein the position sensor is formed in the piston member through the use of a fixed shaft that has been inserted into the aperture from above the pneumatic cylinder, as recited in Claim 1. As clearly illustrated in Figure 1C of Bolt '941, the piston (38) does ***not*** have an aperture formed in a central axis portion thereof and extending along the central axis direction thereof. Rather, the piston (38) is a solid body disposed in the actuator (90) at a position along a length of the solid rod (10).

Further, Bolt '941 does not include a position sensor formed in a piston member through the use of a fixed shaft that has been inserted into the aperture from above the pneumatic cylinder, as recited in Claim 1. As also shown in Figure 1C of Bolt '941, the position sensor (12) is located ***outside*** of the actuator (90) and is ***not*** formed in the piston (12).

Similarly, Liao '199 and Ohsumi '160 do not teach or suggest a piston member slidably accommodated in the pneumatic cylinder in a non-contact state via bearings and a position sensor for detecting the position of the piston member, wherein the piston member has an aperture formed in the central axis portion thereof and extending along the central axis direction thereof, and wherein the position sensor is formed in the piston member through the use of a fixed shaft that has been inserted into the aperture from above the pneumatic cylinder. As illustrated in Figure 7 of Liao '199, the moveable piston (5) of the pneumatic actuator (2) does ***not*** include an aperture formed in a central axis portion thereof. Moreover, the moveable piston (5) does not include a position sensor formed therein through the use of a fixed shaft that has been inserted from above the pneumatic actuator (2). As stated in column 14, lines 5-7 of Liao '199, the

position sensor of the Liao '199 device is a rotary encoder (44) "capable of providing an output signal indicating the relative position of a piston in a rodless cylinder" and is ***not*** formed in the moveable piston (5). Rather, the rotary encoder (44) is located ***outside*** the pneumatic actuator (2) and is ***not*** formed in any part of the piston (5), as shown in Figures 7 and 9 of Liao '199. Accordingly, Liao '199 does not teach or suggest each and every feature recited in Claim 1.

Regarding Ohsumi '160, as illustrated in Figures 1 and 2 thereof, the piston (1) does not include an aperture formed in the central axis portion thereof and extending along the central axis direction thereof, as recited in Claim 1. Such a feature is completely absent from Ohsumi '160. Moreover, the position sensor, *i.e.*, the detection head (9), of Ohsumi '160 is ***not*** formed in the piston member (detection head (9)) through the use of a fixed shaft that has been inserted into the aperture from above the pneumatic cylinder. Rather, the detection head (5) is affixed to a ***side*** of the piston (1), as illustrated in Figures 1 and 2 of Ohsumi '160. Therefore, Ohsumi '160 does not teach or suggest each and every feature recited in Claim 1.

Kawakami '615 and Eigenbrod '002, asserted against Claims 2 and 9 respectively, do not make up for the deficiencies of Bolt '941, Liao '199, and Ohsumi '160. Kawakami '615 and Eigenbrod '002 do not teach or suggest at least the features of a piston member slidably accommodated in the pneumatic cylinder in a non-contact state via bearings and a position sensor for detecting the position of the piston member, wherein the piston member has an aperture formed in the central axis portion thereof and extending along the central axis direction thereof, and wherein the position sensor is formed in the piston member through the use of a fixed shaft that has been inserted

into the aperture from above the pneumatic cylinder, as recited in Claim 1.

In order to establish *prima facie* obviousness, all claim features must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981 (CCPA 1974) and M.P.E.P. § 2143.03. As explained above, Bolt '941, Liao '199, and Ohsumi '160, either alone or in combination, do not teach or suggest each and every feature recited in Claim 1. Therefore, Applicant respectfully submits that Claim 1 is not anticipated by or rendered obvious in view of the cited art of record. Accordingly, Applicant respectfully submits that Claim 1 should be deemed allowable.

Claims 2-10 depend directly or indirectly from Claim 1. Therefore, Applicant respectfully submits that Claims 2-10 should be allowable for at least the same reasons as Claim 1, as well as for the additional subject matter recited therein.

Regarding the 35 U.S.C. § 103(a) rejection of Claim 2, Claim 11 corresponds to previously pending Claim 2, rewritten into independent form. Claim 11 recites, among other features, a control system having a position control system that performs position control until the piston member arrives at a target position; a force control system that performs force control with respect to the piston member by a force based on a load command value, when the piston member arrives at the target position; and a switching section that performs switching between the position control and the force control.

Bolt '941, Liao '199, and Ohsumi '160 are described above.

Kawakami '615 teaches a hydraulic press for moving a slide up and down by the use of a hydraulic cylinder. The slide (2) is lowered from a descending region to a molding region, wherein the position of the slide (2) is controlled on the basis of a position signal detected by a slide position detector (21). A pressure signal obtained

from pressure detectors (19), (20) for detecting the pressing force of the slide (2) is compared with a predetermined capacity set in accordance with a machining condition in the molding region. If the set capacity is not reached, the slide (2) is made to continue its descent to a lower dead point while effecting successively the position control and holding it at that position for a set time. When the set capacity is reached, pressure control, instead of position control, is carried out and the pressure is held for a set time.

However, contrary to the Office Action's assertion, Bolt '941, Liao '199, Ohsumi '160, and Kawakami '615, either alone or in combination, do ***not*** teach each and every feature recited in Claim 11. The Office Action *admits* that Bolt '941, Liao '199, and Ohsumi '160 do not teach or suggest a position control system that performs position control until the piston member arrives at a target position, a force control system that performs force control with respect to the piston member by a force based on the load command value when the piston member arrives at the target position, and a switching section that performs switching between the position control system and the force control system. *See* page 4, lines 20 through page 5, line 4 of the Office Action.

Kawakami '615 also does ***not*** teach or suggest such a feature. The hydraulic press of Kawakami '615 switches from a position control mode to a pressure control mode only after a pressure applied on the slide (2) reaches a set ***pressure capacity***, ***not*** a target position. As clearly stated in column 6, lines 36-45 and 52-59 of Kawakami '615, the slide (2) continues downward until a pressure difference between the pressure detectors (19) and (20) reaches a ***preset pressure data*** (P20). In a case where the detected pressure is found not to have reached the preset value (P20) by the time the

slide (2) reaches a lower dead point position (Z20), a controller (20) will act to maintain the slide (2) at the lower dead position (Z20) for a preset period of time. Alternately, when the pressure detected by the pressure detectors (19) and (20) reaches the preset pressure (P20) before reaching the lower dead point (Z20), the control mode switches from the position control mode to the pressure control mode. Accordingly, the control mode of Kawakami '615 changes from position control to pressure or load control when the slide (2) reaches a predetermined or *target pressure*, ***not*** *a target position.*

Therefore, Kawakami '615 does ***not*** teach or suggest a position control system where the control system performs position control until the piston member arrives at a target position; wherein the control system performs force control with respect to the piston member by a force based on the load command value, when the piston member arrives at the target position; and wherein a switching section of the control system performs switching between the position control and the force control.

As stated above, in order to establish *prima facie* obviousness, all claim features must be taught or suggested by the prior art. M.P.E.P. § 2143.03. Because Bolt '941, Ohsumi '160, Liao '199, and Kawakami '615, either alone or in combination, do not teach or suggest each and every feature recited in Claim 11, Applicant respectfully submits that the Office Action has failed to establish *prima facie* obviousness. Accordingly, Applicant respectfully submits Claim 11 should be deemed allowable.

Claims 12-19 depend directly or indirectly from Claim 11. Therefore, Applicant respectfully submits that Claims 12-19 should be deemed allowable for at least the same reasons Claim 11 is, as well as for the additional features recited therein. Hence, Applicant respectfully requests withdrawal of the rejection.

As also stated above, Claim 20 corresponds to previously pending Claim 7, rewritten into independent form. Claim 20 recites, among other features, a pneumatic cylinder fixed so as to extend along a vertical direction, a piston member slidably accommodated in the pneumatic cylinder in a non-contact state via bearings, wherein the bearings are each a first hydrostatic bearing, wherein the first hydrostatic bearings are constructed by forming, in a piston head, first passages for introducing thereinto gas in the one of the pressure chambers and blowing the gas onto an inner wall of the pneumatic cylinder.

Regarding previously pending Claim 7 and, therefore, Claim 20, the Office Action asserts that Ohsumi '160 teaches bearings that are each a first hydrostatic bearing, and wherein the first hydrostatic bearings are constructed by forming, in the piston head, first passages for introducing thereinto gas in the one of the pressure chambers and blowing the gas onto the inner wall of the pneumatic cylinder.

However, as also clearly shown in Figures 1 and 2 of Ohsumi '160, there are ***no*** passages formed in the piston (1) at all. The Office Action cites column 3, lines 50-55 and column 7, lines 38-47 of Ohsumi '160 in support of the rejection. However, column 3, lines 50-55 of Ohsumi '160 teach that a gas groove (1b) is provided on both end portions of the face including a table (1a) of the piston (1). Further, as indicated in Figure 1 of Ohsumi '160, the gas groove (1b) is not shown as being a passage. In fact, the feature corresponding to the gas groove (1b) is merely indicated as being a surface of the piston (1). Therefore, there is no teaching or suggestion of first passages formed in a piston head for introducing thereinto gas in the one of the pressure chambers and blowing the gas onto the inner wall of the pneumatic cylinder.

Additionally, column 7, lines 38-47 of Ohsumi '160 is directed to a different embodiment that is incompatible and, therefore, could not be combined with the inventions of either Bolt '941 or Liao '199.

According to M.P.E.P. § 2143.02, "[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious." Further, "[i]f proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." *Id.* The embodiment of Ohsumi '160 discussed in column 7, lines 38-47 is illustrated in Figures 7(A) and 7(B) and relates to a positioning device in a ***rotational*** direction in which a ***rotational*** body (31) is arranged in the inner space of the cylinder. The rotational body (31) ***rotates*** about a rotational axis (31a). On the contrary, both Bolt '941 and Liao '199 teach ***linear*** actuators. Therefore, one of ordinary skill in the art would not combine the teachings of the actuator represented in Figures 7(A) and 7(B) of Ohsumi '160 with Bolt '941 or Liao '199, because it would change the operation of the respective inventions as well as render them unsatisfactory for their intended purposes.

Consequently, as explained above, Bolt '941, Liao '199, and Ohsumi '160, either alone or in combination, do not teach or suggest each and every feature recited in Claim 20. Further, there is no motivation or suggestion to combine the teachings of the embodiment of Ohsumi '160 taught in Figures 7(A) and 7(B) and column 7, lines 38-47 with Bolt '941 or Liao '199, because such a combination would change the principle of operation of Bolt '941 and Liao '199 and would render them unsuitable for their intended

purposes. Accordingly, the Office Action has failed to establish a *prima facie* case of obviousness. Consequently, Applicant respectfully submits that claim 20 should be deemed allowable.

Claims 21-28 depend directly or indirectly from Claim 20. Therefore, Applicant respectfully submits that Claims 21-28 should be deemed allowable for at least the same reasons Claim 20 is, as well as for the additional subject matter recited therein.

Accordingly, Applicant respectfully requests withdrawal of the rejections.

Conclusion

In view of the foregoing, reconsideration of the application, withdrawal of the outstanding objection and rejections, allowance of Claims 1-29, and the prompt issuance of a Notice of Allowability are respectfully solicited.

Should the Examiner believe anything further is desirable in order to place this application in better condition for allowance, the Examiner is requested to contact the undersigned at the telephone number listed below.

In the event this paper is not considered to be timely filed, Applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to counsel's Deposit Account No. 01-2300, **referencing docket number 107443-00033**.

Respectfully submitted,
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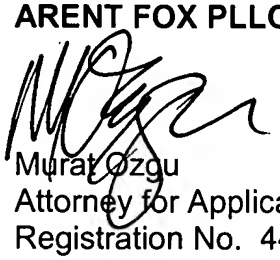

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